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Public Health Guidelines for Enhancing Diabetes Control through *Maternal & Child* Health Programs

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Public Health Guidelines for Enhancing Diabetes Control through Maternal & Child Health Programs

JUNE 1986

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
CENTER FOR PREVENTION SERVICES
DIVISION OF DIABETES CONTROL
ATLANTA, GEORGIA 30333

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These guidelines were developed in collaboration with the Division of Maternal and Child Health, Bureau of Health Care Delivery and Assistance, Health Resources and Services Administration, and The Johns Hopkins University School of Public Health, and have been endorsed by the Association for Maternal and Child Health and Crippled Children's Programs.

Established Diabetes: Highlights of the Guidelines

The estimated 10,000 to 14,000 infants born each year to women with established diabetes mellitus (i.e., diabetes diagnosed before conception) are at high risk for morbidity and mortality due to congenital defects and other severe problems.[1] The mothers are also at increased risk for ketoacidosis, hypoglycemia, and exacerbated microvascular, renal, ocular, and neural complications and other problems as a result of the combined effects of diabetes and pregnancy.[2] Integrating a few procedures at the provider and patient level into the public health setting can significantly improve pregnancy outcomes for women with diabetes and their offspring. These include:

- Aggressive outreach efforts aimed at women of childbearing age with diabetes to encourage preconception counseling followed by early prenatal care;
- Normalization of blood glucose levels prior to conception and throughout gestation. This strategy has been proven effective in reducing the incidence of congenital malformations and other adverse pregnancy outcomes in offspring of women with diabetes.[3] Therefore, it is extremely important for women with diabetes to plan pregnancies and conceive during those times when blood glucose levels are strictly controlled. The public health setting should provide (or assure) preconception counseling to women with diabetes who are considering pregnancy. The importance of planned pregnancies and intensive blood glucose control prior to and throughout pregnancy should be stressed;
- Treating pregnancies in women with established diabetes as high risk and assuring care by health professionals knowledgeable in the management of diabetes and pregnancy;
- Follow-up of pregnant women with diabetes referred outside the public health setting for care to insure that the referral was completed;
- Avoiding excessive weight gain or loss during pregnancy through appropriate nutritional counseling;
- Instituting a rigorous blood glucose self monitoring regimen during pregnancy; techniques for proper self-monitoring should be reviewed with the patient, and patients should have access to the equipment and supplies needed for self-monitoring;
- Self-monitoring of urine daily for the presence of ketones. (Urine is not a sufficiently reliable indicator of glucose levels);
- Avoiding oral hypoglycemic agents to control blood glucose during pregnancy since the effect on the fetus of these antidiabetic agents has not been adequately evaluated;
- Referral for ophthalmologic exam optimally prior to pregnancy or at the earliest time after conception to assess status of retinopathy;
- Postpartum referral of women with diabetes to a source of primary care;
- Providing women with education and counseling about:
  - The importance of achieving ideal body weight to help reduce the incidence of diabetes complications;
  - The importance of glycemic control prior to any subsequent pregnancies and/or referral to family planning for an appropriate contraceptive method.

The public health role, at a minimum, should be: (1) to perform outreach activities to encourage planned pregnancies and preconception counseling; (2) to identify resources and assure access to appropriate care, nutrition counseling, and patient education (whether in the public health setting or by referral); and (3) to follow-up on referrals made for pregnancy, postpartum and continuing care.

Gestational Diabetes: Highlights of the Guidelines

Gestational diabetes mellitus (carbohydrate intolerance of variable severity with onset or first recognition during pregnancy) is estimated to occur in 2 to 3 percent of the pregnant population, more than 90,000 women annually.[4] Gestational diabetes has been associated with poor pregnancy outcome although the magnitude of the problem remains uncertain. Integrating a few procedures into the public health setting may help to improve pregnancy outcomes in women with gestational diabetes. These include:

- Educating health professionals who have contact with pregnant women about the importance of screening for gestational diabetes and about the need for specialized care and follow-up;
- Identifying all women with gestational diabetes through universal screening. In spite of the fact that much work has been done to identify many risk factors for gestational diabetes, to identify all patients with gestational diabetes, universal screening is necessary. It is, therefore, recommended that all pregnant women be screened for gestational diabetes at 24 to 28 weeks gestation (See page 3 for further details regarding recommendations when this may not be possible.). A 50 gm glucose challenge test is recommended. Women with one hour post challenge blood glucose values over 140 mg/dl (plasma) should be referred for definitive diagnosis.[5]
- Definitive diagnosis with a 100 gram oral glucose tolerance test (OGTT);[5]
- Treating pregnancies in women with gestational diabetes as high risk and assuring care by health professionals knowledgeable in the management of diabetes and pregnancy;
- Nutrition counseling for each patient since dietary management is the primary means of maintaining good blood glucose control in gestational diabetes.
- Measuring blood glucose at least once per week (fasting and postprandial);
- Avoiding excessive weight gain or loss;
- Treating patients with highly purified pork or human insulin if insulin is needed to maintain control in gestational diabetes. Oral hypoglycemics should not be used;
- A repeat oral glucose tolerance test (OGTT) at the postpartum checkup to assess persistance of glucose intolerance;
- Counseling women with gestational diabetes regarding the importance of postpartum weight control due to the increased likelihood of developing Type II (non-insulin dependent) diabetes in later years.

The public health role, at a minimum, should be to: (1) identify women with gestational diabetes; (2) identify resources and assure access to appropriate care, nutrition counseling, and patient education (whether provided by the public health setting or by referral); (3) follow-up on referrals made for pregnancy, postpartum and continuing care.

Guidelines

Introduction

This document provides guidelines for an appropriate public health approach to diabetes in pregnancy in maternal and child health programs. Particular concerns for the public health sector include: (1) screening of women to detect gestational diabetes; (2) identification of women with established diabetes who may become pregnant; (3) assuring appropriate care for women with diagnosed diabetes (either established or gestational) on-site or through referral; (4) postpartum follow-up and continuing care of women with established diabetes to maintain good blood glucose control prior to and throughout subsequent pregnancies; and (5) postpartum follow-up of women with gestational diabetes to detect previously undiagnosed established diabetes, to monitor and control body weight to reduce the chance of developing diabetes later in life, and to ensure prompt diagnosis of diabetes if and when it develops.

Key elements are: the identification and establishment of linkages with existing programs and resources and developing the necessary referral and follow-up mechanisms.

I. Statement of the Problem

The presentation of a pregnant woman with established diabetes mellitus or gestational diabetes mellitus to a public health clinic may be a relatively rare event (about 3%-4% of all pregnancies). However, the morbidity associated with pregnancies affected by diabetes may be substantial, since diabetes may result in a disproportionate number of adverse pregnancy outcomes.[1] Therefore, the combination of diabetes and pregnancy presents a special challenge in the public health care setting.

Incorporating several basic guidelines and principles into the public health sector's management of pregnancy may markedly improve pregnancy outcomes for women with either established or gestational diabetes. Guidelines for each of the components are presented on the following pages. With appropriate care, the level of risk associated with diabetes and pregnancy can be reduced to that of the nondiabetic population.

A. Problems Related to Established Diabetes

While only approximately 0.3 percent of all United States pregnancies occur among women with established diabetes, many serious clinical problems are associated with diabetes in pregnancy. The estimated 10,000 to 14,000 infants born annually to women with established diabetes are at high risk for mortality; prematurity; congenital defects; macrosomia; neonatal hypoglycemia; respiratory distress syndrome; and hyperbilirubinemia, particularly when maternal glucose levels are not controlled tightly during pregnancy.[1]

Maternal complications are associated with diabetes during pregnancy and include: ketoacidosis; exacerbated microvascular, renal, ocular, and neural complications; urinary tract infections; toxemia; and hydramnios.[2]

B. Problems Related to Gestational Diabetes

Gestational diabetes mellitus (GDM) occurs in about 2%-3% of pregnancies in the United States[4] and usually develops during the second or third trimester, when levels of insulin-antagonist hormones increase and insulin resistance usually occurs. Approximately 90,000 women with GDM give birth each year. GDM may go undetected in up to 50% of cases.

The effects of GDM on offspring include:[6]

Macrosomia
Birth trauma due to difficult delivery
Shoulder dystocia
Hypoglycemia
Increased incidence of fetal/neonatal mortality particularly from women with previously unidentified adult-onset, Type II, diabetes)
Hypocalcemia
Hyperbilirubinemia

Women with GDM are at increased risk for developing Type II diabetes after parturition.[7] In addition, many women diagnosed as glucose intolerant during pregnancy may be previously unidentified Type II diabetics. This tendency for development of diabetes and the opportunity to identify as yet undiagnosed women with Type II diabetes are also compelling reasons for screening.

C. Opportunities to Improve Outcomes

The public health sector can improve pregnancy outcomes among women with established diabetes and women in whom GDM is detected by several methods, including:

- Identification (including outreach, screening, and diagnosis);
- Care/referral (including appropriate patient education and nutrition counseling, referrals to high-risk centers or to private care);
- Maternal/neonatal follow-up; and
- Professional education.

D. Purpose of the Guidleines

The guidelines should be adapted to the needs of each state, its health care delivery system, and the levels of professional and fiscal resources available. The guidelines are designed to:

- Increase public and provider awareness of the problem and identify special needs related to diabetes before conception and during pregnancy;
- Propose concrete suggestions for enhancing diabetes control through maternal and child health programs in the public health sector by improving coordination of the health care system components, use of resources, and patient involvement in the care regimen; and
- Provide a framework for states/localities to use in adapting these guidelines to meet their specific planning, care, and training needs.

II. Identification of Women with Diabetes

Two components related to the identification of women with diabetes are addressed in this section:

- Outreach, and
- Screening/diagnosis

A. Outreach

Prepregnancy counseling and early prenatal care by professionals knowledgeable about diabetes during pregnancy are particularly important for women with established diabetes. Normalization of maternal glucose levels before pregnancy and during the first 8 weeks of gestation has been effective in reducing the occurrence of congenital malformations.[1] Strict control of glucose throughout pregnancy can reduce the risk of perinatal mortality among infants of mothers with diabetes to a level experienced in nondiabetic pregnant women. Therefore, prepregnancy counseling—with the goal of attaining euglycemia prior to conception and throughout gestation—is important for women with diabetes. Prepregnancy evaluation is also important to assess maternal complications of diabetes, such as detecting the presence of retinopathy, nephropathy, hypertension, and coronary atherosclerosis.

Ideally, a woman with established diabetes is aware of the risks associated with diabetes and pregnancy and will consult a physician when contemplating pregnancy. In reality, however, most women come to a public health care settings already several weeks into gestation.

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Outreach efforts for women with established diabetes include:

- Identifying women with established diabetes who come to family planning clinics and encouraging referral for prepregnancy counseling;
- Asking women with diabetes already under care to disseminate messages to their friends and acquaintances (e.g., through support groups) about the importance of preconception counseling and prenatal care;
- Discussing with women who have established diabetes the importance of glycemic control before pregnancy when they bring children into public health clinics for care;
- Increasing provider awareness through professional education;
- Enlisting the aid of local American Diabetes Association or Juvenile Diabetes Foundation chapters in arranging for public service announcements regarding the importance of planned pregnancy and early care for women with diabetes;
- Developing media campaigns that encourage preconception and early prenatal care (e.g., placing of posters in highly visible areas);
- Providing patient educational materials to local physicians;
- Recruiting and training persons indigenous to the target population, such as volunteers or community health workers, to stress the importance of preconception and early prenatal care and proper nutrition during pregnancy;
- Identifying home health nurses and enlisting their aid in referral for specialized and follow-up care during pregnancy;
- Maintaining communications with directors of nursing and education coordinators of outlying hospitals to ensure the availability of patient education opportunities;
- Working with primary care centers; and
- Developing and identifying specialized care referral centers for women with established diabetes or GDM who cannot be adequately treated in public health care settings.

To maximize resources, localities should develop an outreach plan to target their efforts and to optimally use scarce public health resources.

Unlike women with established diabetes, women who develop GDM need to be identified by health care providers. Therefore, outreach efforts related to identifying GDM should be targeted at those health care professionals who have contact with pregnant women (e.g., nurse-midwives, nurse practitioners, family practitioners, obstetricians, and nutritionists).

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B. Screening and Diagnosis

Screening and diagnostic activities in the public health setting focus on identifying women who develop GDM.

The following recommendations for GDM screening and diagnosis were formulated at the Second International Workshop-Conference on Gestational Diabetes Mellitus.[5]

Many investigators have supported the view that certain risk factors may assist in identifying pregnant women prone to developing GDM. These include: age of 25 years or older; obesity; history of diabetes in a first degree relative; history of pregnancy with stillbirth or infant over 9 pounds; and history of congenital malformations in a previous child. Although a history of hypertension is often cited as a risk factor for GDM, it does not necessarily assist in identifying a women prone to develop GDM. However, it is a serious coexisting condition and can increase the risk of adverse outcome in women with GDM. It is now well accepted that only universal screening can

completely identify all patients with GDM. However, most pregnant patients with these specific risk factors will not have GDM, since GDM occurs in only approximately 2%-3% of the population.

Therefore, it is recommended that, where possible, all pregnant women be screened for GDM.[5] In public health settings, universal screening may not be possible. Therefore, if factors exist that preclude universal screening, all women 25 years of age or older and women with any of the above-mentioned risk factors (regardless of age) should be screened. These factors are not only associated with greater risk of developing GDM but—when present, are more often associated with poor perinatal outcome.

Urine testing alone is not an adequate screening test for glucose intolerance during pregnancy. Blood glucose screening should be performed between 24 weeks' and 28 weeks' gestation.

The following glucose challenge test is recommended:

- Patient is given 50 grams of a standard glucose solution to be ingested in a 10-minute period without regard to time of day or last meal;
- Patient should not eat or smoke until 1-hour blood sample is drawn;
- Blood sample is taken at 1 hour and analyzed by standard techniques.

A venous plasma glucose result of 140 mg/dl (7.8 mmol/L) is recommended as a threshold for referral for definitively diagnosing GDM. Whole blood glucose standards are approximately 15% less than plasma glucose values, (i.e., 119 mg/dl or 6.6 mmol/l).

Indications for screening before 24 weeks' include:

- Previous GDM;
- Previous large-for-gestational-age infant;
- Polyhydramnios;
- Suspected large-for-gestational-age fetus;
- Glycosuria value of 1+ or greater on two or more occasions or 2+ or greater on one occasion;
- Increased thirst or urination;
- Recurrent vaginal and urinary tract infections (e.g., monilial vulvovaginitis).

These high-risk women should be screened on initial visit, or as soon as possible in the pregnancy, and again at 24 weeks' gestation (if not positive on the earlier test).

If blood glucose meters which use capillary blood samples are used for screening, the cut-off values will differ, and the sensitivity and specificity of the procedure will vary from screening using venous plasma. A lower value should be used as a screening cut-off for referral for definitive diagnosis.

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If blood glucose meters are used for screening, the cut-off values will differ, and the sensitivity and specificity of the procedure will vary from screening using venous plasma. A lower value should be used as a screening cut-off for referral for definitive diagnosis.

Definitive diagnosis of gestational diabetes should be accomplished with a 100 gram oral glucose tolerance test (OGTT). The test should be performed in the morning after an overnight fast of at least 8 hours but not more than 14 hours, and after at least 3 days unrestricted diet (over 150 grams carbohydrate) and physical activity. A 100 gram oral glucose load is given in a volume of at least 400 ml fluid. Venous plasma glucose is measured fasting and at 1, 2, and 3 hours. The patient should remain seated and not smoke throughout the test. Definitive diagnosis requires that two or more of the following venous plasma glucose concentrations be met or exceeded:

fasting : 105 mg/dl (5.8 mmol/L)
1 hour : 190 mg/dl (10.6 mmol/L)
2 hour : 165 mg/dl (9.2 mmol/L)
3 hour : 145 mg/dl (8.1 mmol/L)

Capillary blood measurements, using glucose oxidase-impregnated test strips, are useful for monitoring therapy but not sufficiently accurate for diagnostic purposes. Glycosylated hemoglobin (i.e., HbA_1 or HbA_{1c}) is also not a sensitive enough diagnostic indicator for GDM.

III. Referral to Care

Women with established diabetes and women who develop GDM should be considered at high risk and be referred immediately for specialized care if such care is not available on-site. This will insure that activities, such as determination of the appropriate level of care needed by prepregnant and pregnant women with diabetes, consultation, training, referral, and follow-up, are coordinated within the various components of the health care system, be it a public health setting, private medical setting, hospital or community clinic. Optimally, a perinatal center for high risk individuals will be available—particularly for women with established diabetes mellitus—that offers a multi-disciplinary team consisting of an obstetrician/perinatologist, an internist/endocrinologist, a social worker, a dietitian, and a nurse/patient educator. If this level of care is unavailable, the patient should receive, at a minimum, care from a local obstetrician knowledgeable in management of diabetes and pregnancy. Patient education should be an integral part of medical care. The public health role in referrals is to:

- Identify care resources;
- Assure access to care;
- Follow-up to assure that care is obtained; and
- Assure that the care obtained is appropriate.

Obtaining a plan of care from the provider to whom a referral is made is desirable for several reasons:

- It describes the elements that will/will not be provided, which helps the public health clinic identify other resources that may be needed to fill gaps;

- It provides information on the comprehensiveness and quality of care provided by professionals/facilities to whom patients are referred; and
- It may be of value for follow-up for postpartum care or subsequent pregnancies.

The public health sector should retain a role in certain aspects of patient care (such as follow-up, education, social services, transportation, home visits) even though patients may be referred for special needs. While direct care may not be provided to high-risk women in the public health care setting, public health professionals should be aware of the elements of appropriate care to assess the quality of services provided by the professionals/facilities to whom they refer.

- In many centers, if dietary management is not successful in maintaining control [fasting plasma glucose under 105 mg/dl-(5.8 mmol/L)—and/or the 2 hour postprandial plasma glucose under 120 mg/dl-(6.7 mmol/L)—on two or more occasions within a 2 week interval], insulin therapy is initiated.[5] Although these values are even less than those recommended for non-pregnant women with diabetes, the benefits of tight control are believed to outweigh more lax control. Patients should be treated with highly purified pork or human insulin to minimize the likelihood of problems related to insulin antibodies. The safety of oral hypoglycemic agents during pregnancy has not been adequately evaluated, and they are not recommended. If the patient is put on insulin, treatment guidelines for women with established diabetes should be followed;
- If insulin is the therapy of choice, blood glucose should be self-monitored, and patients should be educated to assure appropriate use and evaluated regularly. (Urine testing is not a sufficiently reliable indicator of glucose levels during pregnancy.) Patients who use insulin should measure fasting blood glucose and 2-hour postprandial blood glucose daily to maintain glycemic control as near to normal as possible;
- Ketones should be measured in the clinic and followed up, if positive, to prevent starvation ketosis. If a patient is losing weight, a dietary history should be obtained and caloric intake adjusted carefully based on pregravid weight, levels of exercise, etc.; and
- Breast feeding should be encouraged.

A. Elements of Care for Women with Gestational Diabetes

- It is recommended that patients be seen at regular intervals and have a provider available to them by phone to discuss any problems;
- Dietary management is the primary therapeutic strategy for blood glucose control. Each patient should receive nutrition assessment and counseling;
- Blood pressure should be monitored carefully;
- Maternal weight gain should be monitored. In general, a total weight gain of 24-28 pounds has been recommended. Excessive changes in weight should be avoided, and patients should not attempt to lose weight. A woman's nutritional status needs to be monitored carefully; weight gain recommendations need to be individualized; and nutrition care plans need to be developed accordingly with considerations to factors such as exercise/activity patterns, insulin dosages or other medications, and individual food preferences. A woman's pregravid weight seems to be the most sensitive indicator for weight gain during pregnancy. Many studies propose that women who are underweight pregravid may need to gain more than the usually recommended 24-28 pounds for a normal weight pregravid woman. Similarly, women who are overweight or obese pregravid—often a predisposing risk factor for developing GDM—weight gains less than 24-28 pounds may be sufficient, and intakes of 35-38 kcal/kg ideal body weight appropriately balanced with carbohydrates, fats, and proteins may be more appropriate. Considerably more research in the area is needed.
- In many centers, if dietary management is not successful in maintaining control (fasting plasma glucose under 105 mg/dl-5.8 mmol/L—and/or the 2 hour postprandial plasma glucose under 120 mg/dl-6.7 mmol/L—on two or more occasions within a 2 week interval), insulin therapy is initiated.[5] Although these values are even less than those recommended for non-pregnant women with diabetes, the benefits of tight control are believed to outweigh more lax control. Patients should be treated with highly purified pork or human insulin to minimize the likelihood of problems related to insulin antibodies. The safety of oral hypoglycemic agents during pregnancy has not been adequately evaluated, and they are not recommended. If the patient is put on insulin, treatment guidelines for women with established diabetes should be followed;
- If insulin is the therapy of choice, blood glucose should be self-monitored, and patients should be educated to assure appropriate use and be evaluated regularly. (Urine testing is not a sufficiently reliable indicator of glucose levels during pregnancy.) Patients who use insulin should measure fasting blood glucose and 2-hour postprandial blood glucose daily to maintain glycemic control as near to normal as possible;
- Ketones should be measured in the clinic and followed up, if positive, to prevent starvation ketosis. If a patient is losing weight, a dietary history should be obtained and caloric intake adjusted carefully based on pregravid weight, levels of exercise, etc.; and
- Breast feeding should be encouraged.

B. Elements of Care for Women with Established Diabetes

- Pregnancy should be planned so that blood glucose can be normalized before conception and throughout gestation;

- Throughout pregnancy, glucose levels must be monitored daily by the patient (a minimum of four times daily for best results) and on each visit, by the health care provider;
- The safety of oral hypoglycemic agents in pregnancy has not been established, and they are not recommended;
- The majority of pregnant women with established diabetes will require twice daily injections of both intermediate- and short-acting insulin for control. For patients on twice-daily insulin injections, a dietary program consisting of three meals and three snacks has been suggested.
- Maternal serum alpha-fetoprotein screening for detecting neural tube defects should be performed on all pregnant women at about 16 weeks' gestation, especially those with established diabetes.

C. Nutrition Counseling

- The public health care sector should ensure that nutrition counseling is available. Certain principles apply for both gestational and established diabetes;
- Each patient should receive individual nutrition assessment and counseling consistent with the recommendations for caloric distribution prepared by the American Diabetes Association in 1979;[8]
- The nutrition plan should contain 35-38 kcal/kg ideal body weight and be appropriately balanced with carbohydrates, fats, and proteins;[5]
- Patients should divide their caloric intake among three meals and several snacks;
- The average daily caloric intake for the pregnant woman with diabetes will range from 2000 to 2400 calories. Lactating women may require an additional 600-800 calories daily more than a normal nonpregnant woman;
- Obese patients should not lose weight during pregnancy because weight loss may increase the risks for retarded fetal growth. On the average, a woman should gain 24-28 pounds during pregnancy.

D. Patient Education

Diabetes in pregnancy cannot be managed adequately without patient education and self-management. Therefore, the public health clinic should ensure that patient education is an integral component of the care plan developed for each patient. All pregnant women identified with either GDM or established diabetes should receive:

- Information about the interaction of pregnancy and diabetes;
- Information on the importance and frequency of blood glucose self-monitoring (established diabetes only, unless GDM treated with insulin);
- Instruction on how to self-monitor blood glucose (established diabetes only, unless GDM treated with insulin) and urine testing for ketones;
- Instruction regarding the use of medications; and
- Exercise instruction.

In addition, women with GDM should be instructed in the importance of postpartum weight control, including appropriate exercise, due to the increased likelihood of developing diabetes in later years. Women with established diabetes should be instructed in the importance of preconception counseling and blood glucose normalization before conception in future pregnancies to reduce the risk of congenital anomalies from diabetes. In addition, women should be aware that pregnancy can exacerbate complications of diabetes.

The public health sector can play a major role in instructing patients about self-monitoring. Self-monitoring demonstrates the day-to-day variability in glucose levels; promotes self-discipline, control, and a heightened understanding of the condition; provides immediate feedback on hyperglycemia or hypoglycemia; and provides essential data to enable pregnant women and their health care providers to make appropriate changes in diet, exercise, and insulin therapy.

Because urine glucose testing is not a sufficiently reliable indicator of glucose levels, frequent blood glucose determinations are strongly recommended throughout pregnancy for women with established diabetes or with GDM controlled with insulin. The practitioner should instruct the pregnant woman with established diabetes to test urine for ketones and to self-monitor blood glucose throughout pregnancy. Patients with established diabetes should be informed that insulin requirements may increase substantially in the second and third trimesters. The public health care sector should ensure the availability of equipment for self-monitoring.

IV. Follow-Up

Short and long term follow-up are integral components of care for this high-risk population. In the short term, it is important for the public health sector to identify sources of care during pregnancy to which patients can be referred and then to make certain the referrals are completed.

For women with GDM, a repeat oral glucose tolerance test (OGTT) is recommended at the first postpartum check-up. If the test is positive, the patient should be provided with or referred for treatment; if the test is negative, the patient should be advised that she is still at risk of developing diabetes later in life. She should be informed that the onset of diabetes may be delayed or prevented if she attains and maintains ideal body weight, and, if necessary, a referral for counseling on diet and/or weight control should be made. Regular follow-up and an annual OGTT are recommended.

Follow-up for the woman with established diabetes entails an adjustment of the insulin dosage after delivery (usually to the prepregnancy level), informing the mother about the importance of getting back to her ideal body weight, and achieving and maintaining good blood glucose control postpartum. In addition, it is important to provide counseling for the woman with established diabetes regarding the importance of glucose control before any subsequent pregnancies. Referral to a family planning clinic for an appropriate contraceptive method may also be appropriate.

V. Recommended Resources

Successful pregnancy outcomes depend on linkages and referrals to appropriate care and services. A list of resources that may be used for referral or that may provide educational and promotional materials is presented below. While this list is not exhaustive, it is indicative of the resources available to improve pregnancy outcomes.

American Association of Diabetes Educators

American College of Obstetricians and Gynecologists

American Diabetes Association

Division of Diabetes Control, Center for Prevention Services, CDC

Crippled Childrens' Programs

Diabetes Research and Training Centers

Family Planning Clinics

Juvenile Diabetes Foundation

Maternal and Child Health Programs

National Diabetes Advisory Board

National Diabetes Information Clearinghouse

National Institute of Child Health and Human Development

National Research Council

State Diabetes Control Programs

Womens', Infants', and Childrens' Nutrition Programs (WIC)

VI. References

1. Freinkel N, Metzger BE, Potter JM. Pregnancy in diabetes. In: Ellenberg M, Rifkin H, eds. Diabetes Mellitus: Theory and Practice. New York: Medical Examination Publishing Company, 1983; 689-714.
2. Freinkel N, Dooley SL, Metzger BE. Care of the pregnant woman with insulin-dependent diabetes mellitus. N Engl J Med 1985; 313:96-101.
3. Fuhrmann K, Reiher H, Semmler K, et al. Prevention of congenital malformations in infants of insulin-dependent diabetic mothers. Diabetes Care 1983; 6:219-23.
4. Sepe SJ, Connell FA, Geiss LS, Teutsch, SM. Gestational diabetes: Incidence, maternal characteristics, and perinatal outcome. Diabetes 1985; 34 (Suppl 2):13-6.
5. Summary and recommendations of the Second International Workshop-Conference on Gestational Diabetes Mellitus. Diabetes 1985; 34 (Suppl 2):123-26.
6. Landon MB, Gabbe SG. Antepartum fetal surveillance in gestational diabetes mellitus. Diabetes 1985; 34 (Suppl 2):50-4.
7. Stowers JM, Sutherland HW, Kerridge DF. Long-range implications for the mother. The Aberdeen experience. Diabetes 1985; 34 (Suppl 2):106-10.
8. American Diabetes Association. Principles of nutrition and dietary recommendations for individuals with diabetes mellitus: 1979. Diabetes 1979; 28:1027-30.

ATTACHMENT

General Considerations in Addressing Diabetes and Pregnancy

In providing or coordinating care to this or any other target population, the public health care sector must address several considerations such as the level of public and community services, staffing, and resources. Each of these components is vital to the successful delivery of care and to the improvement of pregnancy outcomes.

A. Services

Provision of services varies considerably from one public health care setting to another. There are, however, certain principles that should underlie a population-based system for prenatal care:

- Prenatal services (including casefinding, care, delivery, and neonatal care) should be available to every pregnant woman;
- Prenatal services should be accessible;
- Prenatal services should encourage early entry into the system and regularity of care;
- Prenatal services should be affordable;
- Prenatal services should meet the needs of special populations (e.g., minorities, teenagers, those with low reading levels); and
- Prenatal services should be monitored for quality.

1. Availability

The public health role should be to ensure that prenatal services are available statewide whether in the form of direct care provided in public health clinics or through screening and referrals to private physicians and high-risk centers. The first step in ensuring availability of resources is to identify those public, private, and voluntary resources that exist in the service area and the extent to which they are able to meet the need for maternal care in the population. The public health role in addressing identified gaps in service will depend upon the level of resources available to (1) establish new services, (2) facilitate coordination among public and private providers, and (3) mobilize local resources.

2. Accessibility

Accessibility to prenatal care is a factor in improving pregnancy outcomes. It is not feasible economically to establish clinics and high-risk centers in every locality. Therefore, many states have adopted a regionalized approach to providing prenatal care. Regionalization efforts have been enhanced by the implementation of the block grant mechanism by providing greater flexibility in directing funds to priority areas. The regionalization of care has encouraged a preventive approach focusing on early risk identification and prompt referral of high-risk patients to specialized care and follow-up.

Other factors affecting accessibility include the difficulty in scheduling appointments with busy, short-staffed clinics, long waits on appointment days due to overcrowded clinics, and the availability of clinic appointments only at certain times or on certain days of the week which may be inconvenient. Having access to a health care provider by telephone may help to fill gaps in care. Transportation to prenatal care clinics and high-risk centers may also be a major barrier to some patients.

3. Affordability

Public health care clinics often screen women for their ability to pay for services. If they fall below certain income criteria, services are usually provided free of charge, or they may be charged a reduced rate according to a sliding fee scale. Some states will also accept women with income levels greater than the established criteria if they are referred by a private obstetrician/gynecologist based on the physician's perception of the patient's inability to pay.

There is concern about that portion of the population with an income level too high to qualify for prenatal care from the public health clinic and too low to afford continued prenatal care from a private provider. These women may see the physician only up to the time they are no longer able to pay for each visit, or they may delay seeking care until they feel they must have it. Several states have developed a prepaid pregnancy package to assist this population in which the woman pays a reduced fee initially for prenatal care services and delivery. (This package of care is less expensive if it is initiated during the first trimester, thereby encouraging early prenatal care.)

4. Responsiveness

Characteristics of the population served by public health prenatal clinics include women primarily under the age of 25 who have a low income and poor nutrition. Many delay seeking medical care resulting in late entrance to prenatal care.

To overcome barriers to obtaining early and regular prenatal care, some public health care clinics have taken special steps to address certain populations and have established links with other programs that may be of assistance. There also have been special outreach efforts to identify pregnant teenagers by increasing teacher awareness and by visiting school health classes.

5. Quality

Monitoring or assessing the quality of services provided requires, at a minimum, two components: (1) standards or guidelines by which to measure quality, and (2) information related to whether those standards are in place. Therefore, state or local public health care programs need to develop a set of standards or guidelines appropriate to their population, level of resources, and other circumstances. In addition, a periodic record review or review of data collected on maternal and perinatal outcomes by source of care should be done to assess whether appropriate care is provided and whether problem areas are related to quality of care or to other factors such as lack of prenatal care or poor nutrition.

B. Staffing

1. Size

The number of people involved in public health prenatal care is primarily determined by the allocation of resources to the local public health setting and by need. Ideally, there should be resources sufficient enough to allot time in providing prenatal care. A 5-7 minute visit, not atypical for a public health care setting, is probably not sufficient to provide good prenatal care.

2. Composition

Pregnant women with diabetes should have access to an array of services. A team approach to care is recommended. Optimally, the composition of a public health prenatal team should include: an obstetrician knowledgeable about diabetes in pregnancy, an internist with an understanding of diabetes in pregnancy, a nurse/patient educator, and a nutritionist. At a minimum, prenatal care for women with established diabetes or GDM should be provided by an obstetrician/gynecologist who is versed in the management of diabetes in pregnancy.

3. Professional Education

The need for professional education should be assessed in each locality and addressed appropriately.

C. Resources

1. Personnel

The necessity of a team approach to providing prenatal care to women with diabetes has been emphasized. While one may determine optimal practice, the reality of what can be done is often different. There may be shortages of personnel to provide the necessary breadth of care for the pregnant women with diabetes. As a result, some aspects such as home visits and patient education are not available or are reduced in scope. It is important, therefore, that linkages and referral mechanisms be developed to supplement the level of available care.

2. Facilities

Ideally, high-risk perinatal care centers are in place and available for referrals. In lieu of a high-risk center, the public health role must focus on how local care may be supplemented to provide specialized care. Resource identification, referral, and follow-up are key attributes of an effective public health approach.

3. Data

To accurately measure the effectiveness or the impact of programs aimed at reducing the incidence of adverse outcomes in pregnancies complicated by diabetes, denominator data, process data, and outcome data will be needed.

Denominator data: number of pregnancies complicated by overt diabetes; number of pregnancies complicated by diabetes diagnosed during pregnancy (GDM).

Process Measures: number of women of childbearing age with diabetes who receive preconception counseling; number of pregnant women with diabetes who intensively control levels of blood glucose; places of delivery for women with diabetes; number of women screened for GDM.

Outcome Measures: perinatal/neonatal mortality associated with maternal diabetes; congenital malformations in offspring of women with diabetes; other morbidity in offspring including macrosomia, respiratory distress syndrome, and hypoglycemia.

4. Funding

The allocation of public dollars to the local level is often perceived as insufficient. However, there may be some flexibility in the use of block grant funds for targeting special need areas. Efficiency in the use of available dollars may be one way to extend resources for care.

5. Resource Coordination

While the focus of this document is the effect of diabetes on pregnancy outcomes, other factors exist that predispose to adverse pregnancy outcomes. Proper nutrition, smoking cessation, abstinence from alcohol, and avoidance of drugs (unless prescribed by a physician) also should be stressed and integrated into appropriate care.

6. Resource Development

The public health role in resource development should be: (1) identifying supplemental funds, (2) locating professionals to supplement the level of care available in the public health care setting, (3) identifying and coordinating supplemental community resources, and (4) finding ways to maximize efficiency and effectiveness. The local affiliates of the American Diabetes Association and the Juvenile Diabetes Foundation may be helpful in this area.